

40. (a) For the universal microwave background, Wien's law leads to

$$T = \frac{2898 \mu\text{m}\cdot\text{K}}{\lambda_{\text{max}}} = \frac{2.898 \text{ mm}\cdot\text{K}}{1.1 \text{ mm}} = 2.6 \text{ K} .$$

(b) At "decoupling" (when the universe became approximately "transparent"),

$$\lambda_{\text{max}} = \frac{2898 \mu\text{m}\cdot\text{K}}{T} = \frac{2898 \mu\text{m}\cdot\text{K}}{10^5 \text{ K}} = 29 \text{ nm} .$$